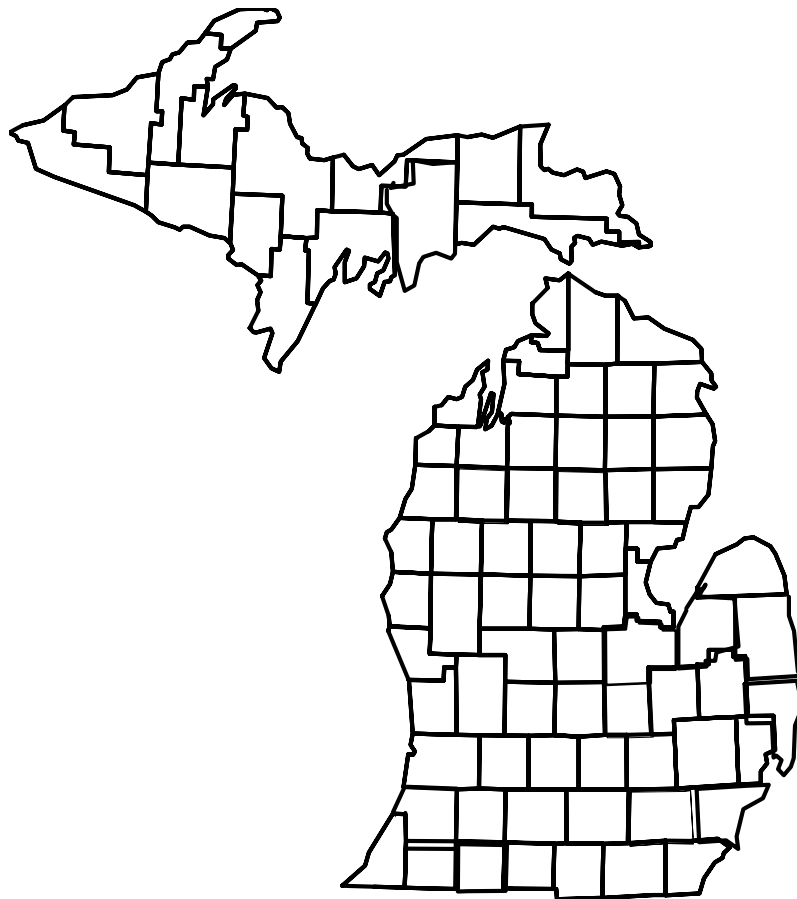


Michigan Uniform Energy Code

Incorporating Chapter 11
of the 2003 edition of
the International Residential
Code

2003

Michigan Department of Labor & Economic Growth
Bureau of Construction Codes



Providing for Michigan's Safety in the Built Environment

Introduction

In 2002, the Department of Labor & Economic Growth established a committee to review and update Michigan's Uniform Energy Code. After review and promulgation of the code, the Ingham County Circuit Court issued an injunction to halt the February 28, 2005, effective date of the rules. Therefore, the rules have been pending litigation since that time. On October 24, 2008, this matter was before the court with a decision following to dismiss the complaint and dissolve the injunction; thereby making the rules effective immediately.

All units of government who administer and enforce a construction code are required to use the rules promulgated under 1972 PA 230, the Stille-DeRossett-Hale Single State Construction Code Act. The Act was amended by 1999 PA 245, effective December 28, 1999, requiring the use of the State Codes as they are updated by rules promulgated after October 15, 1999.

These rules adopt by reference, in R 408.31059 of the Michigan Administrative Code, Chapter 11 of the International Residential Code, 2003 edition, as published by the International Code Council, Inc., and includes deletions, additions, and amendments to Chapter 11 of the International Residential Code.

Michigan amendments are identified as follows:

Double vertical lines denote amendments and additions promulgated by the State of Michigan, Department of Labor & Economic Growth, modifying Chapter 11 of the 2003 International Residential Code.

Additional copies of this publication are available from the Michigan Department of Labor & Economic Growth, Bureau of Construction Codes, P.O. Box 30255, Lansing, Michigan 48909 at a cost of \$2.50. Please make checks payable to the State of Michigan.

Additional information relating to code administration and enforcement in the State of Michigan is also available on the web site.

(By authority conferred on the director of the department of labor & economic growth by section 4 of 1972 PA 230, MCL 125.1504, and Executive Reorganization Order Nos. 1996-2 and 2003-1, MCL 445.2001 and 445.2011)

R 408.31061, R 408.31062, R 408.31063, R 408.31064, R 408.31065, R 408.31066, R 408.31070, of the Michigan Administrative Code are amended, R 408.31059, R 408.31060 and R 408.31069 are added to the Code, and R 408.31071, R 408.31072, R 408.31073, R 408.31074, R 408.31075, R 408.31076, R 408.31077, R 408.31078, R 408.31079, R 408.31080, R 408.31081, R 408.31082, R 408.31083, R 408.31084, R 408.31085, R 408.31086 of the code are rescinded as follows:

R 408.31059 Applicable code.

Rule 1059. Rules governing the energy efficiency for the design and construction of residential buildings shall be those contained in Chapter 11 of the 2003 International Residential Code. With the exceptions noted, Chapter 11 of the 2003 International Residential Code is adopted by reference in these rules. The Michigan uniform energy code is available for inspection or purchase at the Okemos office of the Michigan Department of Labor & Economic Growth, Bureau of Construction Codes and Fire Safety, 2501 Woodlake Circle, Okemos, Michigan 48864, at a cost as of the time of adoption of these rules of \$2.50.

Michigan Uniform Energy Code

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SECTION N1101

GENERAL

N1101.1. Scope. This chapter sets forth the energy efficiency standards for detached 1-and 2-family dwellings and multiple-single family dwellings. One-and 2-family dwellings and multiple-single family dwellings shall be designed and constructed as regulated by the code for energy efficiency.

Exceptions:

1. A detached 1-and 2-family dwelling or portion thereof that has an intended maximum rate of energy usage less than 3.4 Btu/h per square foot of floor space for all purposes.
2. Portions of a detached 1-and 2-family dwelling that is not heated or mechanically cooled.
3. An existing detached 1-and 2-family dwelling, other than replacement fenestration as provided by section N1102.4.
4. An alteration of an existing detached 1-and 2-family dwelling.
5. A detached 1-and 2-family dwelling that is moved into or within a jurisdiction. A home manufactured pursuant to the Michigan premanufactured unit rules that is shipped for initial installation or initial assembly and installation on a building site shall not be considered a moved building.
6. Historical structures listed on the state or national historical register.

N1101.2 Compliance. Compliance with the code shall be demonstrated by meeting the requirements of the applicable sections and tables of the code. Where applicable, provisions are based on the climate zones where the building is located. The climate zone assignments are as set forth in table N1101.2 for the county in which the building is constructed. The permit applicant shall determine the method used to achieve compliance with the provisions of the code at the time of application for permit.

N1101.2.1 Detached 1-and-2 family dwellings. Compliance shall be demonstrated by 1 of the following:

1. Meeting the requirements of the code.
2. Meeting the requirements of the International Energy Conservation Code for detached 1- and 2-family dwellings.
3. Meeting the design, construction and certification requirements under the US EPA Energy Star Homes Program ®.
4. Meeting the design and construction requirements in conformance with the national Home Energy Rating System (HERS) guidelines with a score of 83 or better. A certificate indicating the score prepared by an accredited agency shall be filed with the code official.

R408.31060

Table N1101.2
Climate Zones by County

Zones		
1	2	3
Allegan	Alcona	Alger
Barry	Alpena	Baraga
Berrien	Antrim	Chippewa
Branch	Arenac	Delta
Calhoun	Bay	Dickinson
Cass	Benzie	Gogebic
Clinton	Charlevoix	Houghton
Eaton	Cheboygan	Iron
Genesee	Clare	Keweenaw
Gratiot	Crawford	Luce
Hillsdale	Emmet	Mackinac
Huron	Gladwin	Marquette
Ingham	Grand Traverse	Menominee
Ionia	Iosco	Ontonagon
Jackson	Isabella	Schoolcraft
Kalamazoo	Kalkaska	
Kent	Lake	
Lapeer	Leelanau	
Lenawee	Manistee	
Livingston	Mason	
Macomb	Mecosta	
Monroe	Midland	
Montcalm	Missaukee	
Muskegon	Montmorency	
Oakland	Newaygo	
Ottawa	Oceana	
Saginaw	Ogemaw	
Sanilac	Osceola	
Shiawassee	Oscoda	
St. Clair	Otsego	
St. Joseph	Presque Isle	
Tuscola	Roscommon	
Van Buren	Wexford	
Washtenaw		
Wayne		

R408.31060

N1101.2.2 Townhouses. Compliance shall be demonstrate by either:

1. Meeting the requirements of this chapter for buildings with a glazing area that does not exceed 25 percent of the gross area of exterior walls; or 2. Meeting the requirements of the *International Energy Conservation Code* for residential buildings of Group R-2, R-4 or townhouses.

N1101.3 Materials and equipment. Materials and equipment shall be identified in a manner that will allow a determination of their compliance with the provisions of this chapter. Materials and equipment used to conform to the applicable provisions of this chapter shall be installed in accordance with the manufacturers installation instructions.

N1101.3.1 Insulation. The thermal resistance (*R*-value) shall be indicated on all insulation and the insulation installed such that the *R*-value can be verified during inspection, or a certification of the installed *R*-value shall be provided at the job site by the insulation installer. Where blown-in or sprayed insulation is applied in walls, the installer shall provide a certification of the installed density and *R*-value.

Where blown-in or sprayed insulation is applied in the roof-ceiling assembly, the installer shall provide a certification of the initial installed thickness, settled thickness, coverage area, and number of bags of insulating material installed. Markers shall be provided for every 300 square feet (28m²) of attic area, attached to the trusses, rafters, or joists, and indicate in 1-inch-high (25.4 mm) numbers the installed thickness of the insulation.

N1101.3.2. Fenestration. The *U*-factor of fenestration shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. The solar heat gain coefficient (SHGC) of fenestration shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer.

Exception: Computer simulations by independent NFRC certified laboratories or approval under section 21 of 1972 PA 230, MCL 125.1521 are considered in compliance with this section.

R408.31062

N1101.3.2.1 Default fenestration performance. When a manufacturer has not determined a fenestration products *U*-factor in accordance with NFRC100, compliance shall be determined by assigning such products a default *U*-factor from Tables 102.5.2(1) and 102.5.2(2) in the *International Energy Conservation Code*. When a manufacturer has not determined a fenestration products SHGC in accordance with NFRC 200, compliance shall be deter-

mined by assigning such products a default SHGC from Table 102.5.2(3) of the *International Energy Conservation Code*.

N1101.3.2.2 Air leakage. The air leakage of prefabricated fenestration shall be determined in accordance with AAMA/WDMA 101/I.S.2, 101/I.S.2/NAFS, or NFRC 400 by an accredited, independent laboratory, and labeled and certified by the manufacturer and shall not exceed the values in Table 502.1.4.1 of the *International Energy Conservation Code*. Alternatively, the manufacturer shall certify that the fenestration is installed in accordance with Section 502.1.4 of the *International Energy Conservation Code*.

N1101.3.2.3 R-values of fenestration products. Windows, doors and skylights shall be rated for thermal resistance based on the entire fenestration unit. The *R*-values of all fenestration products in a building shall be the reciprocal of the *U*-factor and meet the requirements set forth in table N1102.1. The *U*-factor may be converted to *R* values by using the inverse of the *U*-factor ($R \text{ value} = 1/U\text{-factor}$).

R408.31062

N1101.3.3 Maintenance. Where mechanical or plumbing system components require preventive maintenance for efficient operation, regular maintenance requirements shall be clearly stated and affixed to the component, or the source for such information shall be shown on a label attached to the component.

N1101.4 Definitions. Definitions shall have the meanings as defined in the code.

R408.31061

SECTION N1102 BUILDING ENVELOPE

N1102.1 Thermal performance criteria. The minimum required insulation *R*-value or the area-weighted average maximum required fenestration *U*-factor (other than opaque doors, which are governed by Section N1102.1.3) for each element in the building thermal envelope (fenestration, roof/ceiling, opaque wall, floor, slab edge, crawl space wall and basement wall) shall be in accordance with the criteria in Table N1102.1. Detached one-and-two family dwellings with greater than 15-percent glazing area; townhouses with greater than 25-percent glazing area; and any residential building in climates with heating degree days equal to or greater than 13,000; shall determine compliance using the building envelope requirements of Chapter 4 or 5 of the *International Energy Conservation Code*.

N1102.1.1 Exterior walls. The minimum required *R*-value in Table N1102.1 shall be met by the sum of the *R*-values of the insulation materials installed in framing cavities and/or insulating sheathing applied, and not by framing, drywall, structural sheathing, or exterior siding materials. Insulation separated from the conditioned space by a vented space shall not be counted towards the required *R*-value.

N1102.1.1.1 Mass walls. Mass walls shall be permitted to meet the mass wall criteria in Table N1102.1.1.1(1), based on the insulation position and the climate zone where the building is located. Other mass walls shall meet the frame wall criteria for the building type and the climate zone where the building is located, based on the sum of interior and exterior insulation. Walls with exterior insulation position have the entire effective mass layer interior to an insulation layer. Walls with integral insulation position have either insulation and mass materials well mixed as in wood (logs); or substantially equal amounts of mass material on the interior and exterior of insulation as in concrete masonry units with insulated cores or masonry cavity walls. Walls with interior insulation position have the mass material located exterior to the insulating material. Walls not meeting either of the above descriptions for exterior or integral positions shall meet the requirements for other mass walls in Table N1102.1.1.1(1). The *R*-value of the mass assembly for typical masonry constructions shall be taken from Table N1102.1.1.1(2). The *R*-value for a solid concrete wall with a thickness of 4 inches (102mm) or greater is R-1.1. *R*-values for other assemblies are permitted to be based on hot box tests referenced in ASTM C 236 or ASTM C 976, two dimensional calculations or isothermal planes calculations.

N1102.1.1.2 Steel-frame walls. The minimum required *R*-values for steel-frame walls shall be in accordance with Table N1102.1.1.2.

N1102.1.2 Ceilings. The required Ceiling *R*-value in Table N1102.1 assumes standard truss or rafter construction and shall apply to all roof/ceiling portions of the building thermal envelope, including cathedral ceilings. Where the construction technique allows the required *R*-value of ceiling insulation to be obtained over the wall top plate, R-30 shall be permitted to be used where R-38 is required and R-38 shall be permitted to be used where R-49 is required.

N1102.1.3 Opaque doors. Opaque doors separating conditioned and unconditioned space shall have a maximum *U*-factor of 0.35. One opaque door shall be permitted to be exempt from this *U*-factor requirement.

N1102.1.4 Floors. The required *R*-value in Table N1102.1 shall apply to all floors, except any individual floor assembly with over 25 percent of its conditioned floor area exposed directly to outside air shall meet the *R*-value requirement in Table N1102.1 for .Ceilings.

N1102.1.5 Basement walls. When the basement is a conditioned space, the basement walls shall be insulated in accordance with Table N1102.1. When the basement is not a conditioned space, either the basement walls or the ceilings separating the basement from conditioned space shall be insulated in accordance with Table N1102.1. When insulating basement walls, the required *R*-value shall be applied from the top of the basement wall to a depth of 10 feet (3048mm) below grade or to the top of the basement floor, whichever is less.

TABLE N1102.1
SIMPLIFIED PRESCRIPTIVE BUILDING ENVELOPE THERMAL COMPONENT CRITERIA MINIMUM
REQUIRED THERMAL PERFORMANCE (U-FACTOR AND R-VALUE)

Exterior Enclosure		Zones		
		1	2	3
Wall Assemblies		R-21	R-21	R-21
Fenestration/Openings (area weighted average of the total area of fenestration units) ¹		U =0.35 (R= 2.85)		
Roof/Ceiling Assemblies ²		R-49	R-49	R-49
Floors over unconditioned spaces		R-21	R-21	R-21
Slab on grade construction ³		R-11, 4ft	R-13, 4 ft	R-18, 4ft
Crawl space walls ⁴		R-20	R-20	R-20
Basement walls	Continuous Insulation	R-10	R-10	R-15
	Cavity Insulation	R-11	R-11	R-19

¹ Fenestration units are required to meet this standard for the entire unit.

² Skylight U (1/R) factors are required to meet the fenestration requirements set forth in this table for fenestration/openings. Skylights are limited to 10% of the gross roof/ceiling area.

³ See section N1102.1.6 for additional installation criteria.

⁴ See section N1102.1.7 for additional installation criteria.

TABLE N1102.1.1.1(1)
MASS WALL PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS

BUILDING LOCATION		MASS WALL ASSEMBLY R-VALUE a (hr·ft ² ·°F) / Btu	
Climate Zone	HDD	Exterior or integral insulation	Other mass walls
1	6,000-6,999	R-15.5	R-18.4
2	7,000-8,499	R-15.5	R-18.4
3	8,500-12,999	R-18.4	R-18.4

For SI: 1 (hr·ft²·°F)/Btu = 0.176 m²·K/W.

TABLE N1102.1.1.2
STEEL-FRAME WALL MINIMUM PERFORMANCE REQUIREMENTS (R-VALUE)

CLIMATE ZONES	HDD	EQUIVALENT STEEL-FRAME WALL CAVITY AND SHEATHING R-VALUE a (hr ft ² °F) / Btu
1	6,000-6,999	R-13+R-10, R-19+R-9, R-25+R-8
2	7,000-8,499	R-13+R-10, R-19+R-9, R-25+R-8
3	8,500-12,999	R-13+R-10, R-19+R-9, R-25+R-8

For SI: 1 (hr·ft²·°F)/Btu = 0.176 m²·K/W.

a. The cavity insulation R-value requirement is listed first, followed by the sheathing R-value requirement.

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TABLE N1102.1.1.1(2)
MASS ASSEMBLY R-VALUES

ASSEMBLY TYPE	UNGROUTED CELLS NOT INSULATED (hr ft ² · °F) / Btu	UNGROUTED CELLS INSULATED (hrft ² ° F) / Btu		
		No grout	Vertical cells grouted at 10 ft. o.c. or greater	Vertical cells grouted at less than 10 ft. o.c.
6" Light weight concrete block	2.3	5.0	4.5	3.8
6" Medium weight concrete block	2.1	4.2	3.8	3.2
6" Normal weight concrete block	1.9	3.3	3.1	2.7
8" Light weight concrete block	2.6	6.7	5.9	4.8
8" Medium weight concrete block	2.3	5.3	4.8	4.0
8" Normal weight concrete block	2.1	4.2	3.8	3.3
12" Light weight concrete block	2.9	9.1	7.9	6.3
12" Medium weight concrete block	2.6	7.1	6.4	5.2
12" Normal weight concrete block	2.3	5.6	5.1	4.3
Brick cavity wall	3.7	6.7	6.2	5.4
Hollow clay brick	2.0	2.7	2.6	2.4

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 (h·ft²° F)/Btu = 0.176 m²·K/W.

N1102.1.6 Slab-on-grade floors. For slabs with a top edge above finished grade or 12 inches (305 mm) or less below finished grade, the required R-value in Table N1102.1 shall be applied to the outside of the foundation or the inside of the foundation wall. The insulation shall extend downward from the top of the slab, or downward to the bottom of the slab and then horizontally in either direction, until the distance listed in Table N1102.1 is reached. When installed between the exterior wall and the edge of the interior slab, the top edge of the insulation shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall. Insulation extending horizontally away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil. In locations of 500 HDD or greater, R-2 shall be added to the values in Table N1102.1 where uninsulated hot water pipes, air distribution ducts or electric heating cables are installed within or under the slab.

Exception: Slab perimeter insulation is not required for unheated slabs in areas of very heavy termite infestation probability as shown in Figure R301.2(6). Where this exception is used, building envelope compliance shall be demonstrated by (a) using *International Energy Conservation Code* Section 502.2.2 or *International Energy Conservation Code* Chapter 4 with the actual slab insulation R-value in Table N1102.1, or (b) using *International Energy Conservation Code* Section 502.2.4.

N1102.1.7 Crawl space walls. Where the floor above the crawl space is uninsulated, insulation shall be installed on crawl space walls when the crawl space is not vented to outside air. The required R-value in Table N1102.1 shall be applied inside of the crawl space wall, downward from the sill plate to the exterior finished grade level and then vertically and/or horizontally for at least an additional 24 inches (610 mm). The exposed

earth in all crawl space foundations shall be covered with a continuous vapor retarder having a maximum permeance rating of 1.0 perm [(57 mg)/(s · m² · Pa)], when tested in accordance with ASTM E 96.

N1102.1.8 Masonry veneer. For exterior foundation insulation, that horizontal portion of the foundation that supports a masonry veneer shall not be required to be insulated.

N1102.1.9 Protection. Exposed insulating materials applied to the exterior of foundation walls shall be protected. The protection shall extend at least 6 inches (152 mm) below finished grade level.

N1102.1.10 Air leakage. All joints, seams, penetrations; site-built windows, doors, and skylights; openings between window and door assemblies and their respective jambs and framing; and other sources of air leakage (infiltration and exfiltration) through the building thermal envelope shall be caulked, gasketed, weather stripped, wrapped, or otherwise sealed to limit uncontrolled air movement.

N1102.1.11 Recessed lighting fixtures. When installed in the building envelope, recessed lighting fixtures shall meet one of the following requirements:

1. Type IC rated, manufactured with no penetrations between the inside of the recessed fixture and ceiling cavity and sealed or gasketed to prevent air leakage into the unconditioned space.
2. Type IC or non-IC rated, installed inside a sealed box constructed from a minimum 0.5-inch-thick (12.7 mm) gypsum wallboard or constructed from a preformed polymeric vapor barrier, or other air-tight assembly manufactured for this purpose, while maintaining required clearances of not less than 0.5 inch (12.7 mm) from combustible material and not less than 3 inches (76 mm) from insulation material.
3. Type IC rated, in accordance with ASTM E 283 admitting no more than 2.0 cubic feet per minute (cfm) (0.944 L/s) of air movement from the conditioned space to the ceiling cavity. The lighting fixture shall be tested at 1.57 psi (75 Pa) pressure difference and shall be labeled.

N1102.2 Maximum solar heat gain coefficient for fenestration products. The area-weighted-average solar heat gain coefficient (SHGC) for glazed fenestration installed in locations with 3,500 or fewer heating degree days shall not exceed 0.40.

N1102.3 Fenestration exemption. Up to 1 percent of the total glazing area shall be exempt from *U*-factor requirement.

N1102.4. Replacement fenestration. Where some or all of an existing fenestration unit is replaced with an entirely new replacement fenestration product, including frame, sash and glazed portion, in an existing building, the replacement fenestration shall have a *U*-factor that does not exceed the maximum fenestration *U*-factor and an SHGC that does not exceed the maximum fenestration SHGC in table N1102.5. Replacement skylights and roof windows shall be permitted to have a maximum *U*-factor of 0.60. The replacement fenestration products shall also satisfy the air leakage requirements of section N1101.3.2.2.

R408.31064

N1102.5 Prescriptive path for additions and window replacements. As an alternative to demonstrating compliance with section N1105 or N1102, additions with a conditioned floor area less than 500 square feet (46.5m²) to existing single-family residential buildings and structures shall meet the prescriptive envelope component criteria in table 1102.5 for the designated heating degree days (HDD) applicable to the location. The *U*-factor of each individual fenestration product (windows, doors and skylights) shall be used to calculate an area-weighted average fenestration product *U*-factor for the addition, which shall not exceed the applicable listed values in table N1102.5. For additions, other than sunroom additions, the total area of fenestration products shall not exceed 40 percent of the gross wall and roof area of the addition. The *R*-values for opaque thermal envelope components shall be equal to or greater than the applicable listed values in table N1102.5. Replacement fenestration products (where some or all of an existing fenestration unit is replaced with an entire new replacement unit, including the frame, sash and glazing) shall meet the prescriptive fenestration *U*-factor criteria in table N1102.5 for the designated HDD applicable to the location.

Conditioned sunroom additions shall maintain thermal isolation; shall not be used as kitchens or sleeping rooms; and shall be served by a separate heating or cooling system, or be thermostatically controlled as a separate zone of the existing system.

Exception: Replacement skylights shall have a maximum *U*-factor of 0.60 when installed in any location above 1,999 HDD.

TABLE N1102.5
PRESCRIPTIVE ENVELOPE COMPONENT CRITERIA
ADDITIONS TO AND REPLACEMENT WINDOWS FOR EXISTING
DETACHED 1- AND 2-FAMILY DWELLINGS

HEATING DEGREE DAYS	MAXIMUM	MINIMUM					
	Fenestration U-factor ^e	Ceiling R-value ^{a,e}	Wall R-value ^e	Floor R-value	Basement wall R-value ^b	Slab perimeter R-value and depth ^c	Crawl space wall R-value ^d
6,000 - 8,499	0.35	R-49	R-21	R-21	R-11	R-13, 4 ft.	R-20
8,500 - 12,999	0.35	R-49	R-21	R-21	R-19	R-18, 4 ft.	R-20

For SI: 1 foot = 304.8 mm.

- a. "Ceiling R-value" shall be required for flat or inclined (cathedral) ceilings. Floors over outside air shall meet "Ceiling R-value" requirements.
 - b. Basement wall insulation shall be installed in accordance with section 502.2.1.6.
 - c. Slab perimeter insulation shall be installed in accordance with section 502.2.1.4. An additional R-2 shall be added to "Slab perimeter R-value" in the table if the slab is heated.
 - d. "Crawl space wall R-value" shall apply to unventilated crawl spaces only. Crawl space insulation shall be installed in accordance with section 502.2.1.5.
 - e. Sunroom additions shall be required to have a maximum fenestration U-factor of 0.50 in locations with 2,000 - 12,999 HDD. In locations with 0-5,999 HDD, the minimum ceiling R-value shall be R-19 and the minimum wall R-value shall be R-13. In locations with 6,000 - 12,999 HDD, the minimum ceiling R-value shall be R-24 and the minimum wall R-value shall be R-13.
- R408.31065

SECTION N1103 MECHANICAL SYSTEMS

[E] N1103.1 Heating and air conditioning appliance and equipment performance. Performance of equipment listed in Table N1103.1 is covered by preemptive Federal law. Appliances and equipment not listed in Table N1103.1 shall meet the minimum efficiency requirements of Section 503.2 of the *International Energy Conservation Code*.

N1103.2 Controls. At least one thermostat shall be provided for each separate heating, cooling, or combination heating and cooling system. Heat pumps shall have controls that prevent supplementary electric resistance heater operation when the heating load can be met by the heat pump alone. Supplementary heater operation shall be permitted during outdoor coil defrost cycles not exceeding 15 minutes.

N1103.3 Duct insulation. All portions of the air distribution system shall be installed in accordance with Section M1601 and be insulated to an installed R-5 when system components are located within the building but outside of conditioned space, and R-8 when located outside of the building. When located within a building envelope assembly, at least R-8 shall be applied between the duct and that portion of the assembly furthest from conditioned space.

Exception: Exhaust air ducts and portions of the air distribution system within appliances or equipment.

N1103.4 Duct sealing. All ducts shall be sealed in accordance with Section M1601.3.1.

[E] N1103.5 Piping insulation. All mechanical system piping shall be insulated in accordance with Table N1103.5.

Exceptions: Piping installed within appliances and equipment or piping serving fluids between 55 °F (13 °C) and 120 °F (49 °C).

SECTION N1104 SERVICE WATER HEATING

[E] N1104.1 Water heating appliance and equipment performance. Performance of equipment listed in Table N1104.1 is covered by preemptive Federal law. Appliances and equipment not listed in Table N1104.1 shall meet the minimum efficiency requirements of Section 504.2 of the *International Energy Conservation Code*.

**TABLE N1103.1
MINIMUM EQUIPMENT PERFORMANCE**

EQUIPMENT CATEGORY	SUBCATEGORY ^e	REFERENCED STANDARD	MINIMUM PERFORMANCE
Air-cooled heat pumps heating mode < 65,000 Btu/h cooling capacity	Split systems Single package	ARI 210/240	6.8 HSPF _{a,b} 6.6 HSPF _{a,b}
Gas-fired or oil-fired furnace < 225,000 Btu/h	—	DOE 10 CFR Part 430, Subpart B, Appendix N	AFUE 78% ^b Et 80% ^c
Gas-fired or oil-fired steam and hot-water boilers < 300,000 Btu/h	—	DOE 10 CFR Part 430, Subpart B, Appendix N	AFUE 78% ^{b,d}
Air-cooled air conditioners and heat pumps cooling mode < 65,000 Btu/h cooling capacity	Split systems Single package	ARI 210/240	10.0 SEER ^b 9.7 SEER ^b

For SI: 1 Btu/h = 0.2931 W.

- a. For multi-capacity equipment, the minimum performance shall apply to each capacity step provided. Multi-capacity refers to manufacturer-published ratings for more than one capacity mode allowed by the products controls.
- b. This is used to be consistent with the National Appliance Energy Conservation Act (NAECA) of 1987 (Public Law 100-12).
- c. These requirements apply to combination units not covered by NAECA (three-phase power or cooling capacity 65,000 Btu/h).
- d. Except for gas-fired steam boilers, for which the minimum AFUE shall be 75 percent.
- e. Seasonal rating.

**TABLE N1103.5
MINIMUM HVAC PIPING INSULATION THICKNESSES^a**

PIPING SYSTEM TYPES	FLUID TEMP RANGE (°F)	INSULATION THICKNESS inches ^b
Heating systems		
Low pressure/temperature	201-250	1.5
Low temperature	120-200	1.0
Steam condensate (for feed water)	Any	1.5
Cooling systems		
Chilled water refrigerant or brine water, refrigerant or brine	40-55	0.75
	Below 40	1.25

For SI: 1 inch = 25.4 mm, °C = [(°F)-32]/1.8.

- a. The pipe insulation thicknesses specified in this table are based on insulation *R*-values ranging from R-4 to R-4.6 per inch of thickness. For materials with an *R*-value greater than R-4.6, the insulation thickness specified in this table may be reduced as follows:
 New Minimum Thickness = $\frac{4.6 \times \text{Table Thickness}}{\text{Actual } R\text{-Value}}$

For materials with an *R*-value less than R-4, the minimum insulation thickness shall be increased as follows:

New Minimum Thickness = $\frac{4.0 \times \text{Table Thickness}}{\text{Actual } R\text{-Value}}$

For piping exposed to outdoor air, increase thickness by 0.5 inch.

**TABLE N1104.1
REQUIRED PERFORMANCE OF DOMESTIC HOT WATER HEATING EQUIPMENT
SUBJECT TO MINIMUM FEDERAL STANDARDS**

CATEGORY	MAXIMUM INPUT RATING	MINIMUM EFFICIENCY
Electric; storage or instantaneous	12 kW	0.93 -0.00132 °TM V _a
Gas; storage	75,000 Btu/h	0.62 -0.0019 °TM V _a
Gas; instantaneous	200,000 Btu/h	0.62 -0.0019 °TM V _a
Oil; storage	105,000 Btu/h	0.59 -0.0019 °TM V _a
Oil; instantaneous	210,000 Btu/h	0.59 -0.0019 °TM V _a

For SI: 1 Btu/h = 0.2931 W, 1 gallon = 3.785 L.

- a. V is the rated storage volume in gallons as specified by the manufacturer.

N1105.1 Building design. Residential design by systems analysis. A building designed in accordance with this section is considered in compliance with the code if the calculated heating energy consumption is not more than that of a standard design building envelope designed in accordance with the code. The use of this compliance method is at the election of the permit applicant. For a proposed alternate building design to be considered similar to the standard design, the proposed alternate building design shall be the same as the standard design for all of the following:

1. Floor area.
2. Thermal envelope area.
3. Exterior design conditions.
4. Occupancy.
5. Climate data.
6. Usage operational schedule.

N1105.1.1 Standard building design criteria. The standard building design criteria shall include the following:

1. Gas and oil-fired heating source efficiency rating of 78% AFUE.
2. An air changes per hour (ACH) rate of 0.55 for the purpose of calculation only.
3. For reduced ACH levels, documentation of a post-construction blower-door test shall be provided to the code official.
4. A simplified heating degree day (HDD) approach for the appropriate zone, as follows:
 - a. Zone 1 6900 HDD.
 - b. Zone 2 7800 HDD.
 - c. Zone 3 9300 HDD.

Exception: The typical meteorological year (TMY), or its ersatz equivalent, from the national oceanic and atmospheric administration (NOAA) or an approved equivalent, for the closest available location, may be used for the proposed alternative design.

N1105.1.2 Analysis method. The analysis methodology or calculation tool used for comparison of the heating energy usage of the standard and the proposed alternative building design shall be the same.

N1105.1.3 Analysis Report. A heating energy analysis comparison shall be submitted to the code official including all of the following information:

- a. The design criteria used to develop the standard design and the proposed alternative design.
- b. A detailed technical comparison of the 2 building and system designs.
- c. The data used in, and resulting from, the comparative analysis to verify that both the analysis and the design meet the criteria of this section and sections N1105.1 to N1105.2.

R408.31066

N1106.1 Renewable energy source analysis. A building designed to use a renewable energy sources for all or part of its energy source shall be designed and constructed in compliance with the requirements of this section.

Exception: The renewable energy may be excluded from the total heating energy consumption allowed for the building.

- a. The renewable energy shall be derived from a specific collection, storage, or distribution system.
- b. The heating energy derived from renewable sources and the reduction in conventional heating energy requirements shall be separately identified from the overall building energy use.
- c. Supporting documentation on the basis of the performance estimates for the renewable energy sources shall be submitted to the code official.

R408.31069

N1107.1 Heating energy analysis comparison report. A heating energy comparison report shall be submitted to the code official to include both of the following information:

1. A basic description of the proposed alternate building design and any exceptions to the standard design criteria.
2. Abbreviated report form N1107.1, comparing the alternative house design with a standard design house complying with the provisions of this chapter through the systems analysis method.

R408.31070

Abbreviated Report Form N1107.1
Heating Energy Analysis Comparison Report

Builder=s Name:
 Project Address:
 City/Township/County:

PROPOSED ALTERNATIVE HOUSE		STANDARD DESIGN HOUSE	
ROOF/CEILING (INC. SKYLIGHTS)	SUBTOTALS	ROOF/CEILING (INC. SKYLIGHTS)	SUBTOTALS
$A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_3 \text{ _____ } / R_3 \text{ _____ } = A_3 / R_3 \text{ _____}$ $\text{_____} / R = A_1 / R_1 + A_2 / R_2 + A_3$ Total Roof/Ceiling Area	Line 1	$\text{_____} \times 0.0204 =$ Total Roof/Ceiling Area (all zones)	Line A
GROSS WALL		GROSS WALL	
Opaque Wall (Does not include band joist, windows, doors, etc.) $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 =$	Line 2		
Band Joist $A \text{ _____ } / R \text{ _____ } = A / R \text{ _____ } =$	Line 3		
Fenestration and Doors, Windows $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_3 \text{ _____ } / R_3 \text{ _____ } = A_3 / R_3 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 + A_3 / R_3 =$	Line 4		
Doors $A_1 \text{ _____ } / R_1 \text{ _____ } = A_1 / R_1 \text{ _____}$ $A_2 \text{ _____ } / R_2 \text{ _____ } = A_2 / R_2 \text{ _____}$ $A_1 / R_1 + A_2 / R_2 =$	Line 5		
Other $A \text{ _____ } / R \text{ _____ } = A / R \text{ _____ } =$ _____ Total Gross Wall Area	Line 6		
GROSS WALL SUBTOTAL A/R (Lines: 2+3+4+5+6)	Line 7	$\text{_____} \times 0.093 =$ Total Gross Wall Area (all zones)	Line B

FOUNDATION/FLOOR	SUBTOTALS	FOUNDATION/FLOOR	SUBTOTALS
Floors Over Unconditioned Spaces		Floors Over Unconditioned Spaces	
A _____ /R _____ = A/R _____ =	_____ Line 8	_____ x 0.0476 = Total Floor Area (all zones)	_____ Line C
Slab on Grade Floors (Area = Perimeter x 2')		Slab on Grade (Unheated)	
A _____ /R _____ = A/R _____ =	_____ Line 9	_____ Z ₁ 0.0909 _____ x Z ₂ 0.0769 =	_____ Line D
		Total Slab Edge Area Z ₃ 0.050	
		Slab on Grade (Heated)	
		_____ Z ₁ 0.0769 _____ x Z ₂ 0.0667 =	_____ Line E
		Total Slab Edge Area Z ₃ 0.050	
Crawl Space Walls (Area: Top foundation wall to average finished grade)		Crawl Space	
A _____ /R _____ = A/R _____ =	_____ Line 10	_____ x 0.050 = Total Crawl Space Wall Area (all zones)	_____ Line F
Basement Walls (Area: Top foundation wall to average finished grade)		Basement Walls	
A ₁ _____ /R ₁ _____ = A ₁ /R ₁ _____			
A ₂ _____ /R ₂ _____ = A ₂ /R ₂ _____			
A ₁ /R ₁ + A ₂ /R ₂ =	_____ Line 11	_____ Z ₁ 0.090 _____ x Z ₂ 0.090 =	_____ Line G
Basement Windows		Total Gross Basement Wall Area Z ₃ 0.055	
A _____ /R _____ = A/R _____ =	_____ Line 12		
Total Gross Basement Wall Area			
FOUNDATION/FLOOR SUBTOTAL A/R (Lines: 8+9+10+11+12)	_____ Line 13	FOUNDATION/FLOOR SUBTOTAL A/R (Lines: C+D+E+F+G)	_____ Line H
PROPOSED ALTERNATIVE HOUSE SUB-TOTAL A/R (Lines: 1+7+13)	_____ Line 14	STANDARD DESIGN HOUSE SUB-TOTAL A/R (Lines: A+B+H)	_____ Line I

HEATING EQUIPMENT EFFICIENCY (If the same as Standard House, go to line 16 or 17)		HEATING EQUIPMENT EFFICIENCY	
(Oil or Gas Fired) AFUE: _____%		(Oil or Gas Fired) AFUE: 78%	
Line 14: _____ = Adjusted A/R =		Line I: _____ = Adjusted A/R =	
AFUE: 0._____	_____ Line 15	AFUE: 0.78	_____ Line J
AIR LEAKAGE RATE (If the same as Standard House, go to line 17)		AIR LEAKAGE RATE	
_____ ACH x _____		0.55 ACH x _____ ft ³ x 0.018	
ft ³ x 0.018 =	_____ Line 16	=Volume of House	_____ Line K
Air Changes per Hour			
Volume of House			
PROPOSED ALTERNATIVE HOUSE TOTAL (Lines: 15+16)		STANDARD DESIGN LIMIT TOTAL (Lines: J+K)	
Equal to or less than line L to pass	_____ Line 17		_____ Line L

N1107.1.1 Alternative design constants. The alternative design constants of table N1107.1 may be used for the specific site weather data (heating degree days) for the proposed alternative design.

Table N1107.1
Alternative Standard Design Constants (1/r) for Systems Analysis Approach

Heating Degree Days	6000 – 6499	6500 – 6999	7000 – 7499	7500 – 7999	8000 – 8499	8500 – 8999	9000 +
Roof/Ceiling	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204
Gross Wall	0.093	0.093	0.093	0.093	0.093	0.093	0.093
Foundation/floor Floor over unconditioned space	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476
Slab on grade Unheated slab	0.0909	0.0909	0.0769	0.0769	0.0769	0.050	0.050
Heated Slab	0.0769	0.0769	0.0667	0.0677	0.0667	0.050	0.050
Crawl space	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Basement wall	0.0909	0.0909	0.0909	0.0909	0.0909	0.0555	0.0555

N1107.2 Compliance. The proposed alternative design shall be determined to be in compliance when the proposed alternative house A/R total (line 14 or line 17 of abbreviated report form N1107.1) is less than or equal to the standard design house (line I or line L of abbreviated report form N1107.1).
R408.31070

Rule 1099. Rescission.

R 408.31001 to R 408.31055 of the Michigan Administrative Code, appearing on pages 4149 to 4152 of the 1979 Michigan Administrative Code and pages 602 and 603 of the 1981 Annual Supplement to the Code, are rescinded.

R 408.31099

PART 10a.

Rule 1087. Part 10a Michigan uniform energy code for buildings and structures, not including residential buildings; adoption by reference.

Rules governing the energy efficiency for the design and construction of buildings and structures, not including residential buildings, shall be those contained in the ASHRAE energy standard for buildings except low-rise residential buildings, ANSI/ASHRAE/IESNA standard 90.1-1999, including appendices A, B, C, and D. With the exceptions noted, the standard is adopted in these rules by reference. The standard is available for inspection at the Okemos office of the Michigan Department of Consumer and Industry Services, Bureau of Construction Codes. The standard may be purchased from the American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, Georgia 30329, or from the Michigan Department of Consumer and Industry Services, Bureau of Construction Codes, 2501 Woodlake Circle, Okemos, Michigan 48864, at a cost as of the time of adoption of these rules of \$102.00 each.

R 408.31087

Rule1088. Definitions.

Section 3.2 of the standard is amended to read as follows:

3.2 Building official. "Building Official" means the person who is appointed and employed by a governmental subdivision charged with the administration and enforcement of the state code or codes and who is registered in accordance with the requirements of 1986 PA 54, MCL 338.2301 et seq.

Residential. "Residential" means spaces in buildings used primarily for living and sleeping. Residential spaces include, but are not limited to, dwelling units, hotel/motel guest rooms, lodging houses, fraternity/sorority houses, and hostels.

R 408.31088

Rule1089. Heating, ventilating, and air-conditioning alternations.

Section 4.1.2.2.2 of the standard is amended to read as follows:

4.1.2.2.2 New HVAC equipment as a direct replacement of existing HVAC equipment shall comply with the specific minimum efficiency requirements applicable to that equipment including, but not limited to, air conditioners and condensing units, heat pumps, water chilling packages, packaged terminal and room air conditioners and heat pumps, furnaces, duct furnaces, unit heaters, boilers, and cooling towers. Any new control devices as a direct replacement of existing control devices shall comply with the specific requirements of sections 6.2.3. to 6.2.3.9.

Exceptions:

- (a) For equipment that is being modified or repaired but not replaced provided that such modifications will not result in an increase in energy usage.
- (b) Where a replacement or alteration of equipment requires extensive revisions to other systems, equipment, or elements of a building and such replaced or altered equipment is a like-for-like replacement.
- (c) For a refrigerant change of existing equipment.
- (d) For the relocation of existing equipment.

R 408.31089

Rule 1090. Administrative requirements.

Section 4.2 of the standard is amended to read as follows:

4.2 Administrative requirements relating to permits, enforcement, interpretations, and appeals shall be in accordance with 1972 PA 230, MCL 125.1504 et seq.

R 408.31090

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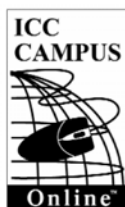
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